Placing $\tan\theta=t$, $d\theta=\dfrac{dt}{1+t^2}$, $\sin\theta=\dfrac{t}{(1+t^2)^{\frac{1}{2}}}$, and $\cos\theta=\dfrac{1}{(1+t^2)^{\frac{1}{2}}}$.

Integrating, we obtain,

$$y+c=-\tfrac{3}{4}[(\tan\tfrac{1}{2}\theta)^{-\frac{4}{3}}+(\tan\tfrac{1}{2}\theta)^{\frac{4}{3}}]\frac{2.16^{\frac{1}{3}}a^2}{27.2^{\frac{7}{3}}}=-\frac{a^2}{36}\left[\left(\tan\tfrac{1}{2}\theta\right)^{-\frac{4}{3}}+\left(\tan\tfrac{1}{2}\theta\right)^{\frac{4}{3}}\right]$$

from which, by substitution, the solution may be completed.

III. Solution by WILLIAM HOOVER, Athens, Ohio.

Let $dy/dx=p$, as usual; then $p^3-axp+x^3=0$.

The condition for equal values of p from this cubic is

$$\frac{p^6}{4}=\frac{a^3p^3}{27}, \text{ or } p=\frac{dy}{dx}=\frac{a}{3}\sqrt[3]{4}.$$

Integrating, $\dfrac{3y}{a\sqrt[3]{4}}=x+c$, or, $27y^3=4a^3(x+c)^3$.

Also solved by S. G. Barton.

MECHANICS.

255. Proposed by the late G. B. M. ZERR, Ph. D.

Assuming the resilience of volume of mercury to be constant at all depths and to be 54.20×10^{10} in *C. G. S.* units and that a mile = 160933 centimeters. Find the depth of an ocean of mercury at a point where its density is double the surface density, 13.596.

Solution by B. F. FINKEL, Ph. D., Drury College.

Let x_0 be the length of a column of mercury of one square centimeter cross-section and uncompressed, such that its weight is sufficient to compress a cubic centimeter to half its volume, which is equivalent to doubling its density.

By Hooke's law, $p=E\dfrac{\Delta v}{v}=\tfrac{1}{2}E$, where E is the coefficient of elasticity. But $p=13.596gx_0$.

$\therefore x_0=\dfrac{E}{27.192g}$. Let Δx_0=the amount of compression of the column by virtue of its own weight, and let x=the length of any portion of the column measured from the surface downward, and let dx be an element of length of this column. Then the strain, s, in this element is

$s=\frac{d(\triangle x_0)}{dx}$. But by Hooke's Law, $s=\frac{p}{E}$. Hence, $\frac{d(\triangle x_0)}{dx}=\frac{p}{E}$

$=\frac{13.596gx}{E}$, or $d(\triangle x_0)=\frac{13.596gxdx}{E}$, and

$$\therefore \triangle x_0=\frac{13.596g}{E}\int_0^{x_0}xdx=\frac{13.596g(\frac{1}{2}x_0^2)}{E}=\frac{6.798gx_0^2}{E}$$

$\therefore$ The depth of the ocean required is $x=x_0-\triangle x_0$

$$=\frac{E}{27.192g}-\frac{6.798g}{E}\left(\frac{E}{27.192g}\right)^2=\frac{E}{27.192g}\left[1-\tfrac{1}{4}\right]$$

$$=\frac{3E}{108.768g}\text{cm.}=\frac{3E}{108.768\times160933\times g}\text{mi.}$$

Using $g=981$, and $E=33\times10^{10}$, we have $x=61.8$ miles.

REMARK. We are unable to get data from which to obtain Dr. Zerr's value for the volume resilience. The value of E as given in Kimball's *Physics*, page 158, and which we have used in the above solution, is very different from what would be obtained from Dr. Zerr's value for volume resilience.

NOTES AND NEWS.

The fifth regular meeting of the Southwestern Section of the American Mathematical Society was held at Washington University, St. Louis, Missouri, on Saturday, December 2, 1911. S.

The eighteenth summer meeting of the American Mathematical Society was held at Poughkeepsie, New York, on September 12-13, 1911. There were about thirty-five members in attendance and twenty-six papers were presented. S.

The twenty-ninth regular meeting of the Chicago Section of the American Mathematical Society will be held at the University of Chicago on Friday and Saturday, December 29, 30, 1911. Titles and abstracts of papers to be presented at this meeting should be sent to the secretary of the Section, Professor H. E. Slaught, the University of Chicago, Chicago, Illinois. S.